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RF/RMRS-98-246

Sampling and Analysis Plan for the Hydrogeologic Characterization of Individual Hazardous Substance Sites (IHSSs) 121 and 148 at Building 123

Final

July 1998
Revision 0

SAMPLING AND ANALYSIS PLAN FOR THE HYDROGEOLOGIC CHARACTERIZATION OF INDIVIDUAL HAZARDOUS SUBSTANCE SITES (IHSSs) 121 AND 148 AT BUILDING 123

RF/RMRS-98-246

Revision 0

July 20, 1998

This Sampling and Analysis Plan has been reviewed and approved by

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ACRONYMS

ALARA	As Low As Reasonably Achievable
Am	Americium
APO	Analytical Project Office
AR	Administrative Records
ASD	Analytical Services Division
Be	Beryllium
BRCS	Building Radiation Cleanup Standard
BTEX	benzene, toluene, ethylbenzene, and xylenes
$C_2H_4O_2$	acetic acid
CAP	Corrective Action Process
CDPHE	Colorado Department of Public Health and the Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Cm	curium
Cs	cesium
DER	Duplicate Error Ratio
DOE	U S Department of Energy
DQO	Data Quality Objective
EDD	Electronic Disc Deliverable
EMD	Environmental Management Department
EMSL	Environmental Monitoring Support Laboratory
EPA	U S Environmental Protection Agency
ER	Environmental Restoration
FID	Flame Ionization Detector
FIDLER	Field Instrument for the Detection of Low Energy Radiation
FO	Field Operations
GC/MS	Gas Chromatography/Mass Spectrometry
GPS	Global Positioning System
H_2SO_4	sulfuric acid
HCl	hydrochloric acid
$HClO_4$	perchloric acid
HF	hydrofluoric acid
HNO_3	nitric acid
HPGe	high-purity germanium
HRR	Historical Release Report
IHSS	Individual Hazardous Substance Site
IMP	Integrated Monitoring Plan
K-H	Kaiser-Hill
LLW	Low-level waste
NaOH	sodium hydroxide
NH_4OH	ammonium hydroxide
OPWL	Original Process Waste Line
OU	Operable Unit
PAC	Potential Area of Contamination

ACRONYMS (cont'd)

PAM	Proposed Action Memorandum
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PID	Photoionization detector
PPE	Personal protective equipment
Pu	plutonium
QA/QC	Quality Assurance/Quality Control
QAPD	Quality Assurance Program Description
RCRA	Resource Conservation and Recovery Act
SWD	Soil and Water Database
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RMRS	Rocky Mountain Remediation Services, L L C
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SOPs	Standard Operating Procedures
TAL	Target Analyte List
TCFM	trichlorofluoromethane
TCL	Target Compound List
TOC	total organic carbon
TSDF	treatment, storage, and disposal facility
U	uranium
UBC	under building contamination
VOC	volatile organic compound

LIST OF APPLICABLE STANDARD OPERATING PROCEDURES (SOPs)

Identification Number	Procedure Title
2-G32-ER-ADM-08 02	*Evaluation of ERM Data for Usability in Final Reports*
2-S47-ER-ADM-05 15	*Use of Field Logbooks and Forms*
5-21000-OPS-FO 03	*General Equipment Decontamination, Section 5 3 1, Cleaning Steel or Metal Sampling Equipment Without Steam in the Field*
4-S02-ENV-OPS-FO 04	*Handling Purge and Development Water*
4-H66-ER-OPS-FO 05	*Handling Purge and Development Water*
5-21000-OPS-FO 06	*Handling of Personal Protective Equipment*
5-21000-OPS-FO 07	*Handling of Decontamination Water and Wash Water*
4-K55-ENV-OPS-FO 10	*Receiving, Marking, and Labeling Environmental Materials Containers*
RMRS/OPS-PRO 069	*Containing, Preserving, Handling and Shipping of Soil and Water Samples*
5-21000-OPS-FO 15	*Photoionization Detectors and Flame Ionization Detectors*
5-21000-OPS-FO 16	*Field Radiological Measurements*
5-21000-OPS-GT 01	*Logging Alluvial and Bedrock Material*
5-21000-OPS-GT 05	*Plugging and Abandonment of Boreholes*
5-21000-OPS-GT 06	*Monitoring Wells and Piezometer Installation*
5-21000-OPS-GT 10	*Borehole Clearing*
5-21000-OPS-GT 17	*Land Surveying*
4-S64-ER-OPS-GT 39	*Push Subsurface Soil Sampling*
5-21000-OPS-GW 01	*Water Level Measurements in Wells and Piezometers*
5-21000-OPS-GW 02	*Well Development*
5-21000-OPS-GW 05	*Field Measurement of Groundwater Field Parameters*
5-21000-OPS-GW 06	*Groundwater Sampling*

3-PRO-140RSP-09 03	*Radiological Characterization of Bulk or Volume Solid Materials*
RM-06 02	*Records Identification, Generation and Transmittal*
RM-06 04	*Administrative Record Document Identification and Transmittal*

SAMPLING AND ANALYSIS PLAN FOR THE HYDROGEOLOGIC CHARACTERIZATION OF INDIVIDUAL HAZARDOUS SUBSTANCE SITES (IHSSs) 121 AND 148 BUILDING 123

1.0 INTRODUCTION

1 1 Purpose

Thıs samplıng and analysıs plan provıdes for a hydrogeologıc ınvestıgatıon of Buıldıng 123 ın support of post-demolıtıon hazardous and radıologıcal sıte characterızatıon actıvıtıes requıred for Indıvıdual Hazardous Substance Sıtes (IHSSs) 121 and 148 and Potentıal Areas of Contamınatıon (PACs) These actıvıtıes are desıgned to accomplısh two objectıves 1) prepare an IHSS rankıng for prıorıtızıng the sıte on the Envıronmental Restoratıon (ER) rankıng lıst, and 2) assess the potentıal ımpact of decontamınatıon and demolıtıon (D&D) actıvıtıes on local groundwater qualıty The ınvestıgatıon ıs beıng conducted by the Rocky Mountaın Remedıatıon Servıces (RMRS) ER Groundwater Group on behalf of Kaıser-Hıll Company, Inc (K-H) for the U S Department of Energy/Rocky Flats Fıeld Office (DOE/RFFO) Implementatıon of thıs project wıll be performed ın accordance wıth applıcable Federal, State, and local regulatıons, as well as DOE Orders, Rocky Flats Envıronmental Technology Sıte (RFETS) polıcıes and procedures, and Envıronmental Restoratıon Operatıng Procedures

Fıeld actıvıtıes planned under thıs work plan are lımıted to well ınstallatıon, well development, and ınıtıal groundwater samplıng actıvıtıes Addıtıonal groundwater samplıng for long-term D&D monıtorıng wıll be accomplıshed by the Groundwater Monıtorıng Program as specıfıed ın the Integrated Monıtorıng Plan (IMP) Soıl characterızatıon actıvıtıes conducted for ER rankıng and fulfillment of crıterıa set forth ın the *Proposed Actıon Memorandum (PAM) for the Decommıssıonıng of Buıldıng 123* (RMRS, 1997a) wıll be accomplıshed separately under the *Soıl Samplıng and Analysıs Plan to Characterıze Indıvıdual Hazardous Substance Sıtes (IHSSs) 121 and 148 at Buıldıng 123* (RMRS, 1997d)

The objectıve of thıs SAP ıs to defıne specıfıc data needs, samplıng and analysıs requırements, data handlıng procedures, and assocıated Qualıty Assurance/Qualıty Control (QA/QC) requırements for thıs project All work will be performed in accordance with the RMRS Quality Assurance Program Description (QAPD) (RMRS, 1997b)

1 2 Background

[Note Section 1 2 is provided, with minor modifications, from RMRS (1997d)]

Building 123 is located on Central Avenue between Third and Fourth Streets at the Rocky Flats Environmental Technology Site (Figure 1-1) The Building 123 area encompasses overlapping IHSSs 121 and 148 and a portion of RCRA Unit 40 (Figure 1-2)

Four (4) associated Potential Areas of Contamination (PACs), 100-601, 100-602, 100-603, and 100-611 have been identified in the RFETS *Historical Release Report* (HRR) (DOE 1992c), as shown in Figure 1-2 The PACs were established as the result of documented spill incidents

Unconfirmed reports of contaminant spills have been indicated in interviews with building employees In the late 1960's or early 1970's a cesium-contaminated liquid was spilled on the concrete floor in Room 109C (Figure 1-2) The floor was immediately sealed to immobilize the contamination No further action was initiated to address consequences of the spill During demolition, additional radionuclide hot spots were detected during radiological surveys of Rooms 103/105, 111, and 123/124

1 2 1 IHSS 121

IHSS 121 consists of RCRA Unit 40 underground Original Process Waste Lines (OPWLs) P-1, P-2, and P-3, which were designated in the *Final Phase I RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan For Operable Unit 9* (DOE 1992a) The area has also been identified as PAC 000-121 in the HRR (DOE, 1992c) The OPWL system constitutes former Operable Unit No 9 (OU 9) and RCRA Unit 40, the plant-wide process waste system comprised of tank and underground pipelines constructed to transport and temporarily store process wastes from point of origin to on-site treatment and discharge points

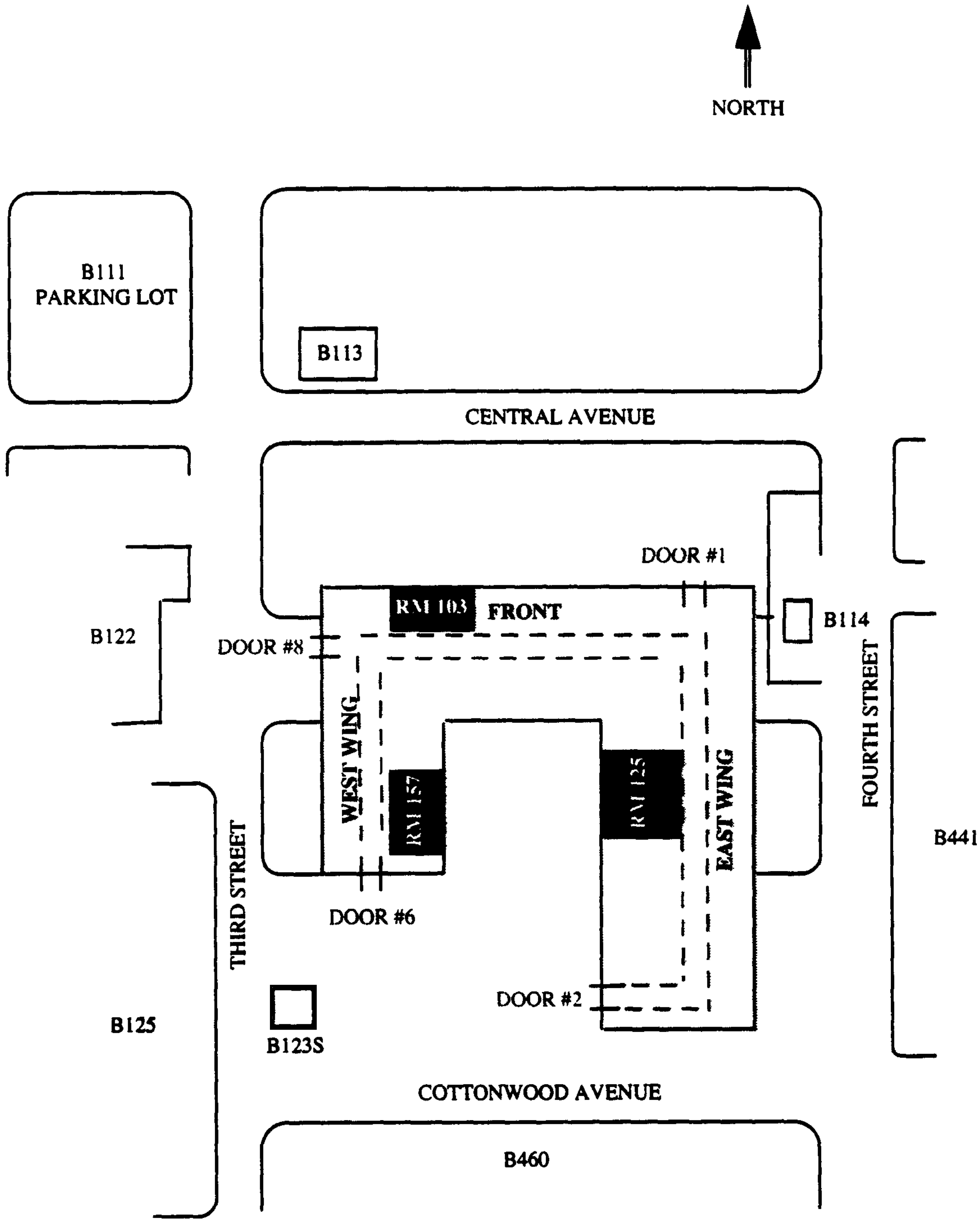


Figure 1-1 Building 123 Site Location

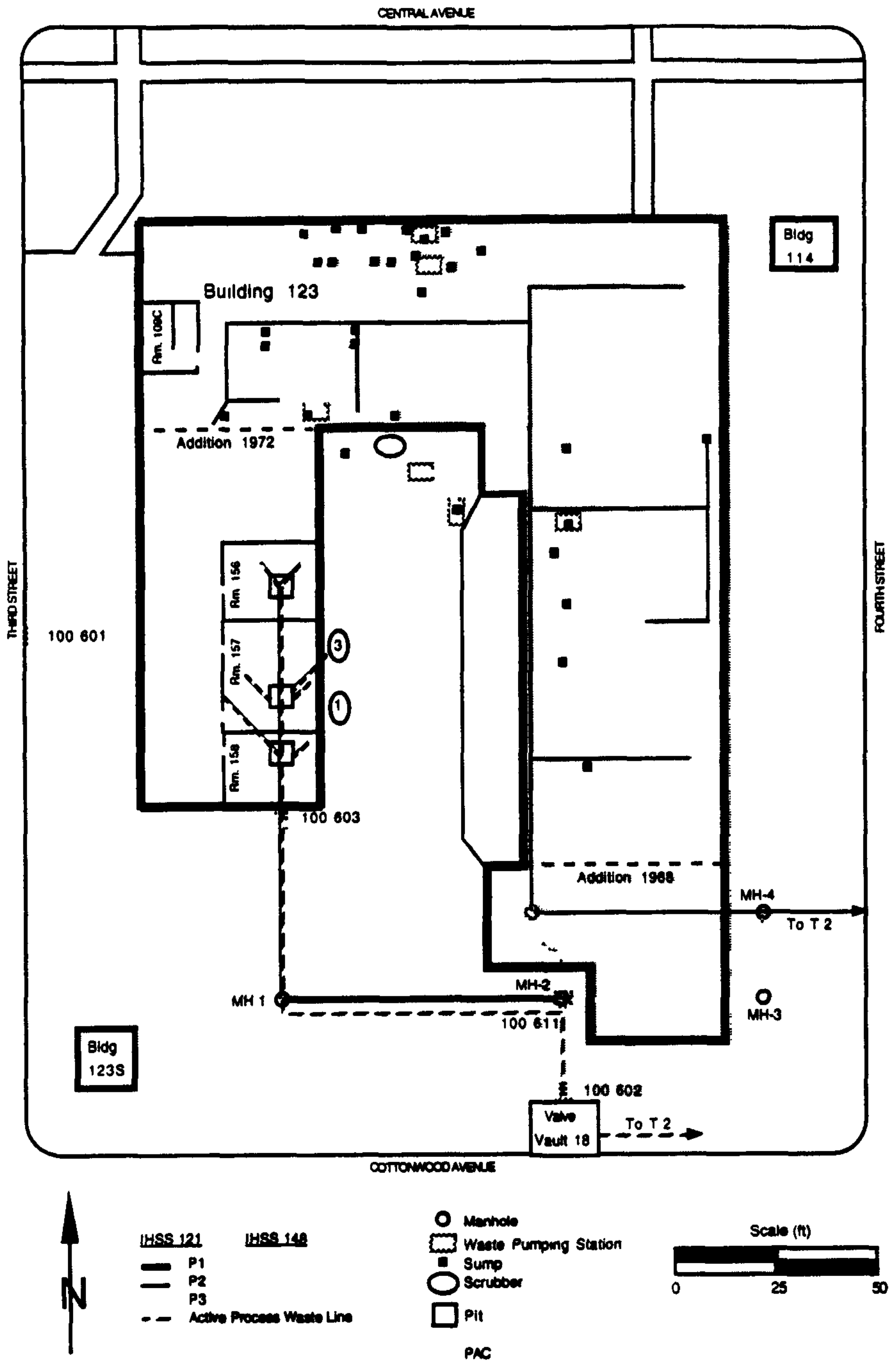


Figure 1-2 Location of Building 123 and Associated IHSSs 121 and 148

All process waste generated from 1952 to 1968 was transferred from Building 123 to Building 441 through line P-2, which ran below the west side of the east wing before exiting at the southeast corner of the building In 1968, the east wing was extended about fifty (50) feet to the south Prior to the building addition, two manholes (MH-2 and MH-3, Figure 1-2) were constructed and the line was extended south to MH-2, then east to MH-3, and north to MH-4, before assuming the original path at P-2 The extension was designated as P-3 One manhole was abandoned and covered by the building addition In 1972, a west wing was constructed, extending south from the northwest corner of the original building Prior to construction of the wing, line P-1 was installed to transfer waste to manhole MH-1, then east to a junction with P-3 at MH-2 (Figure 1-2) The lines transferred the following process waste from Building 123

- Acids nitric acid (HNO_3), hydrofluoric acid (HF), sulfuric acid (H_2SO_4), hydrochloric acid (HCl), acetic acid ($C_2H_4O_2$), and perchloric acid ($HClO_4$),
- Bases ammonium hydroxide (NH_4OH) and sodium hydroxide (NaOH),
- Solvents acetone, alcohols, cyclohexane, toluene, xylenes, triisooctomine, and ether,
- Radionuclides various isotopes of plutonium (Pu), americium (Am), uranium (U), and curium (Cm),
- Metals beryllium (Be) (trace amounts), and
- Others ammonium thiocyanate, ethylene glycol, and possible trace amounts of polychlorinated biphenyls (PCBs) (DOE 1992a)

In 1982, P-2 and P-3 were abandoned and plugged with cement In 1989, the process waste transfer system was upgraded, including removal of the east-west section of P-1 between MH-2 and MH-3 The north-south section of P-1 between Building 123 and MH-1 was converted to the new process system Three (3) large, interconnected concrete sump pit areas were installed in Rooms 156, 157, and 158 to accommodate process waste system backup Pipe was installed connecting MH-1 to Valve Vault 18 A second building addition was also made to the south end of the east wing, partially overlying line P-3 (Figure 1-2)

During building operation, all process waste throughout Building 123 was collected in floor sumps Each sump collected and temporarily stored liquid waste which was then pumped through overhead lines into a main floor sump in Room 158 The waste was then gravity-fed through P-1 to Valve Vault 18, then to underground Tank T-2 (Tank 853) at Building 428, and finally to Building 374 for treatment (Fıgure 1-2)

1 2 2 IHSS 148

A detaıled characterızatıon of former Operable Unıt No 13 (OU 13) was conducted from September 1993 to February 1995 as part of a Phase I RCRA RFI/RI (DOE, 1995) The characterızatıon ıncluded hıgh-purıty germanıum (HPGe) surveys, vertıcal soıl profiles, surface soıl samplıng and soıl gas surveys The ınvestıgatıon ıdentıfied an area of reported small spılls of nıtrate-bearıng wastes along the east sıde of Buıldıng 123 and a potentıal for soıl contamınatıon beneath the buıldıng due to possıble leaks ın OPWL P-2 The area was establıshed as IHSS 148 and detaıled ın the *Fınal Phase I RFI/RI Work Plan for Operable Unıt 13* (DOE 1992b) The area has also been ıdentıfied as Under Buıldıng Contamınatıon (UBC) 123 and PAC 100-148 ın the HRR

Thırty-four (34) analytes were detected ın the surface soıl survey, ıncludıng twenty-sıx (26) ınorganıc compounds and eıght (8) radıonuclıdes Eleven (11) analytes exceeded background lımıts at a mınımum of one sample locatıon throughout IHSS 148 Constıtuents that exceeded mınımum detectıon levels or actıvıtıes are ındıcated ın Table 1-1

Table 1-1 Constıtuents Detected above Mınımum Detectıon Levels or Actıvıtıes ın Soıl Samples Collected durıng Surface Soıl Survey at IHSS 148

Constıtuents Detected Above Mınımum Detectıon Levels or Actıvıtıes	Maxımum Concentratıon	Background Lımıts[a]	Tier II Soıl Actıon Levels[b]
Chromıum	95 6 mg/kg[c]	24 9 mg/kg[c]	4860 mg/kg[d]
Cobalt	28 7 mg/kg	24 8 mg/kg	123,000 mg/kg
Copper	43 4 mg/kg	27 3 mg/kg	81,800 mg/kg
Lead	165 mg kg	61 4 mg/kg	1000 mg/kg
Nıckel	52 4 mg/kg	26 8 mg/kg	40,900 mg/kg
Strontıum	94 7 mg/kg	90 1 mg/kg	>1,000,000 mg/kg
Zınc	1,220 mg/kg	86 6 mg/kg	>1,000,000 mg/kg
Amerıcıum-241	0 197 ± 0 032 pCı/g	0 0227 pCı/g	38 pCı/g
Plutonıum-239/240	0 169 ± 0 04 pCı/g	0 066 pCı/g	252 pCı/g

Constituents Detected Above Minimum Detection Levels or Activities	Maximum Concentration	Background Limits[a]	Tier II Soil Action Levels[b]
Uranium-233/234	2 04 ± 0 396 pCi/g	2 253 pCi/g	307 pCi/g
Uranium-238	2 14 ± 0 309 pCi/g	2 00 pCi/g	103 pCi/g

[a] Source DOE 1995, *Geochemical Characterization of Background Surface Soils Background Soils Characterization Program,* May

[b] Source DOE 1996, *Final Rocky Flats Cleanup Agreement*, July Metal analyte action levels are based on office worker exposure to soil, radionuclide action levels are based on annual dose limits

[c] Result indicates total chromium (chromium III + chromium VI)

[d] Result indicates chromium VI only Action level for chromium III is > 1,000,000 mg/kg

The soil-gas survey was conducted on a 25-foot grid in accordance with the 0U-13 RFI/RF work plan (DOE 1992b) Samples were analyzed in the field using Gas Chromatography/Mass Spectrometry (GC/MS) Sixty-four (64) soil-gas locations were sampled during the survey Thirteen (13) samples contained volatile organic compound (VOC) levels in excess of the 1 μg/L method detection limit Benzene, toluene, ethylbenzene, and xylene (BTEX) fuel constituents were detected in samples collected from the perimeter of Building 123 and within the east and west wings of the building Trichlorofluoromethane (TCFM) was detected in nine (9) samples distributed throughout the IHSS 148 area at levels up to 2 6 μg/L Tetrachloroethene (PCE) was detected at 1 5 μg/L in a sample collected to the east of Building 123 The presence of organic extraction constituents is consistent with unconfirmed reports that such liquids used in radionuclide analyses were occasionally disposed onto the soil surface outside of Building 123 and allowed to evaporate The soil gas analytical results indicate that a potential for residual subsurface VOC contamination of soils and possibly groundwater exist at Building 123

1 2 3 Resource Conservation and Recovery Act (RCRA) Unit 40

The Building 123 area encompasses a portion of RCRA Unit 40, which includes all active overhead and underground and process waste lines in and around Building 123 No other RCRA unit exists within the Building 123 area A plan for partial closure of RCRA Unit 40 was written to characterize and manage all active OPWLs associated with Building 123, as all abandoned lines were properly decommissioned prior to implementation of RCRA regulations

1 2 4 Potential Areas of Contamination (PACs)

PACs 100-601, 100-602, 100-603, and 100-611 were identified in the HRR, and involve potential impact to the soils surrounding Building 123 All of the four (4) PACs are located in Figure 1-2 The following outlines the nature of each PAC by describing the occurrence, constituents released, and response to the occurrence

PAC 100-601, Phosphoric Acid Spill

On April 13, 1989, two five (5)-gallon plastic containers of phosphoric acid, which were among other containers of waste chemicals awaiting disposal in a storage cabinet outside of Building 123, deteriorated and leaked a portion of the contents onto the paved ground surface Approximately one (1) gallon of 1,2 ethylhexyl phosphoric acid leaked from the containers At the time the release was detected, approximately eight ounces of the liquid were present on the ground within the vicinity of the cabinet The spill was contained and the remaining liquid was properly disposed No further action was required to address consequences of the spill

PAC 100-602, Process Waste Line Break

On April 13, 1989, Valve Vault 17, located on Cottonwood Avenue between Building 443 and 444, was found to be flooded with approximately 1,200 gallons of aqueous waste Subsequent investigation indicated that the source of the waste was a break in the active portion of P-1 in manhole MH-1 (Figure 1-2) Leakage from the break had migrated into bedding material surrounding the pipe and ultimately reached Valve Vault 17 through either pipe bedding materials (i e, soils) or a PVC electrical conduit The release also migrated into a section of the OPWL network Discharge of Building 123 process waste into the broken line was discontinued on April 18, 1989, five (5) days after the initial detection of release at Valve Vault 17 The potentially affected area includes the active process waste line between MH-2 and Valve Vault 18, the process waste line between Valve Vault 18 and Valve Vault 17, soils surrounding Valve Vault 18 and Valve Vault 17, and OPWL P-3 between MH-2 and MH-3 In July 1989, groundwater containing blue dye used several months earlier to trace the release was observed seeping into excavations around Valve Vault 18

The release consisted of Building 123 process waste An estimate was made of types and quantities of materials released to the environment during the five (5)-day period between detection of the release and diversion of Building 123 wastes from the broken line The estimate was based on typical daily quantities of wastes discharged from Building 123

- 25 gallons urine,
- 12 5 gallons nitric acid (concentration unknown),
- 20 gallons hydrochloric acid (concentration unknown),
- 1 5 lbs ammonium thiocyanate,
- 1 0 lbs ammonium iodide, and
- 2 5 lbs ammonium hydroxide (concentration unknown)

The above wastes would have been diluted in approximately 2,000 gallons of tap water

Minor amounts of uranium were detected in soil and water samples collected after the release Alpha activity up to 140 pCi/L was recorded in samples of the waste from Valve Vault 17 One water sample from MH-2 also contained eight percent ethylene glycol Soil sampling was conducted to determine the source and extent of the release (See Section 1 2 2) A temporary surface line was installed, and a replacement underground line was installed in 1989 as part of the process line upgrades Since the affected areas were located near existing IHSSs scheduled for investigation and remediation activities, no cleanup was initiated Water and soil samples collected for several weeks after the release indicated that contamination levels (nitrates, chlorides and pH) decreased steadily after the broken line was bypassed

<u>PAC 100-603, Bioassay Waste Spill</u>

On June 9, 1989, OPWL P-1 was under excavation and replacement due to a break in the line (PAC 100-602) The excavated end of the broken line as temporarily capped with a plastic bag, and Building 123 process waste was rerouted to bypass the broken line A pump used to reroute the waste failed and allowed the waste to overflow into the broken line A portion of the waste leaked around the plastic bag and into the excavation The release was confined to the excavation

The release consisted of bioassay waste containing hydrochloric acid and nitric acid The waste exhibited a pH of approximately 1 The waste may also have contained urine, and up to a combined total of 1 5 gallons of ammonium thiocyanate, ammonium iodide and ammonium hydroxide The estimated maximum volume of the spill was 30 gallons The released material commingled with rainwater in the excavation

Potential flow from the excavation was contained with earthen berms Approximately 100 gallons of rainwater contaminated by the spill were neutralized, pumped from the excavation, and transferred to the process system for treatment in Building 374 Samples were collected to evaluate the spread of contamination Results indicated that contamination was restricted to the excavation within eight (8) feet of Building 123 No further action has been initiated

PAC 100-611, Building 123 Scrubber Solution Spill

On November 7, 1989, an inoperative pump in the Building 123 process waste transfer system caused the Building 123 Scrubbers 1 and 3 to overflow, spill scrubbing solution into a bermed area outside of the building and into three sump pits in Rooms 156, 157, and 158 (Figure 1-2) All of the spilled solution was contained within secondary containment structures, and none of the solution was believed to have impacted the environment The pits were pumped out and the concrete liners properly sealed The transfer pump failure was determined to be the result of blockage caused by glass filtering wool

The scrubbing solution consisted primarily of water and was used to scrub acids and salts used in Building 123 Approximately fifty (50) gallons were released to the bermed area, and several hundred gallons were contained in the three sump pits Analysis indicated that the solution contained in the bermed area exhibited a pH of 1 6, the solution in the three pits indicated a pH of 6 0 All spilled materials were contained and transferred into the Building 123 process waste transfer for eventual treatment at Building 374

1 3 Hydrogeologic Setting

Building 123 is situated on a gently eastward sloping topographic and bedrock pediment surface mantled by about 28 to 30 feet of unconsolidated Rocky Flats Alluvium and underlain mainly by claystones and siltstones of the Cretaceous Laramie Formation (EG&G, 1995a) The average depth to groundwater is estimated to range from 2 to 6 feet resulting in an alluvial saturated thickness of approximately 22 to 28 feet (EG&G, 1995b) Water table fluctuations of up to 6 5 feet are recorded in nearby wells 5071 and 5671 (1993-1994 data), with a seasonally high depth to water of 2 to 3 feet below ground level The closest currently active upgradient and downgradient wells to Building 123 are P415989, located 610 feet to the west, and P115489, located 470 feet to the northeast Wells 5071 and 5671 were permanently sealed and abandoned in 1994 due to concerns involving well integrity and construction (EG&G, 1995c) Figure 1-3 illustrates the location of existing and abandoned monitoring wells found in the Building 123 area

Analysis of groundwater flow patterns in the vicinity of Building 123 is complicated by a lack of sufficient well control near the building and the divergent nature of the flow field in this area of the Site According to previous interpretations (RMRS, 1997e, Plates 2 and 3), groundwater at Building 123 is expected to flow predominently in a northeast direction with a horizontal hydraulic gradient of about 0 024 ft/ft, assuming isotropic conditions Figure 1-4 illustrates the original potentiometric contours from 2nd quarter 1996 data presented by RMRS (1997e, Plate 2) A broad ridge-like pattern dominates the flow field in this region of the Industrial Area, which creates a poorly-defined groundwater divide just to the south of Building 123 This divide appears to exist mainly as a result of natural topographic and geologic controls, but may be influenced by major anthropogenic features, such as the 400-building complex located to the south and southeast As this map does not account for potential flow perturbations caused by subsurface Industrial Area structures, it is necessary to examine the validity of existing potentiometric contouring in more detail prior to designing the monitoring well network

The presence of subsurface barriers or sinks, such as building basements, foundation drains, excavations, and buried utility corridors can locally alter groundwater flow directions and lead to spreading of contaminant plumes According to EG&G (1994), relatively few buildings in the vicinity of Building 123 were constructed with foundation drains (Buildings 111, 129, 444, and 447) In general, the drains for these buildings have a small footprint and are not located immediately adjacent to Building 123 Building 460, located to the south, is notable because it was constructed 4 to 5 feet below grade (northeast corner near Building 123) and relies on a buried storm sewer system for drainage The west storm sewer line extends the entire length of the building in a north-south direction at an estimated depth of 4 to 5 feet Evidence of groundwater discharge to this line was observed on May 12, 1998, at two inlet grates located at the north and south ends of the west Building 460 sewer line At the north inlet grate, groundwater seepage was noted entering the concrete inlet structure along a seam at a depth of about 2 feet A continuous trickle of water was observed issuing from the pipe at the south inlet grate before joining with the east line and discharging to the Woman Creek drainage Additional discharge is assumed to occur through permeable bedding material that typically encloses underground lines A natural seepage area located due south of Building 664 also contributes to the drainage of the 400-complex area

Figure 1-4 illustrates a reinterpretation of second quarter 1996 potentiometric contours in the Building 123 area compared to RMRS (1997e, Plate 2) This reinterpretation accounts for the influence of building foundation drains and deeply buried storm sewer lines using floor and drain invert elevations provided in EG&G (1994), and inferred depths to water at wells 5071 and 5671 for 2nd quarter 1996 conditions Building 460, in conjunction with the storm sewer and foundation drains of other buildings in the 400-complex, appears to have slightly depressed the water table, which narrows the groundwater ridge and effectively causes the groundwater divide to shift about 200 feet northward from that originally depicted by RMRS (1997e, Plate 2) The effect of this depression is expected to be greatest during spring when water levels reach seasonal highs and interact more extensively with subsurface drainage structures Depression of the potentiometric configuration at the 400-complex is expected to result in a more eastward groundwater flow direction at Building 123 than shown in RMRS (1997e, Plate 2) Based on the available data, the potential for a southeast component of flow from Building 123 toward the 400-complex appears to be unlikely, at least for most of the year Temporary diversion of shallow groundwater flow may also occur along utility corridors (i e , water, sewer and storm drain systems) that traverse the area along the surrounding roadways at depths of up to 6 feet For example, the sanitary sewer system in the vicinity of Building 123 was identified as a probable area of sewer line infiltration during high groundwater level periods by EG&G (1994)

These structures are assumed to affect shallow groundwater flow only during brief, high water level periods associated with the annual spring recharge event

The nearest receiving stream for groundwater originating at Building 123 is probably South Walnut Creek, located 3,000 feet to the northeast, based on flow path analysis of potentiometric data The groundwater flow velocity for conservative (non-reactive) constituents is estimated at 50 ft/yr, assuming a geometric mean hydraulic conductivity of 2 1 x 10^{-4} cm/sec (EG&G, 1995b, Table G-2), effective porosity of 0 1, and hydraulic gradient value given above This velocity translates to a minimum contaminant travel time to surface water of about 60 years Actual contaminant travel times can be expected to be much longer for highly retarded contaminants such as plutonium, americium, and cesium, and slightly longer for weakly retarded contaminants, such as VOCs and metals

Building 123 lies upgradient of the known Tier II action level extent of the Industrial Area VOC groundwater plume and is distinguished as having the westernmost IHSS locations in the Industrial Area Concentrations of contaminants greater than Tier II groundwater action levels have not been observed in wells P415989, P416289, P115489, and 4486, which monitor upgradient and downgradient groundwater quality in the general area of Building 123 The potential for building-related contaminant migration to groundwater is restricted by extensively paved areas that abut the building and function to impede infiltration and groundwater recharge The results of a dye test conducted in 1989 on a broken process waste line (PAC 100-602) indicated dye migration into an excavation at Valve Vault 18 (DOE 1992a), thus establishing the line as potential release route to groundwater

2.0 SAMPLING RATIONALE

Historical information detailed in Section 1 2 provides general indications of the types of compounds anticipated at each IHSS, and was used to develop a systematic sampling strategy for this investigation The sampling rationale also accounts for the presumed direction of groundwater flow evaluated in Section 1 3 and the need for establishing background (upgradient) groundwater quality benchmarks for selected contaminants-of-concern Monitoring well locations have been selected along groundwater flow paths associated with contaminant release areas Groundwater sampling will be restricted to new monitoring wells installed at Building 123, however, water level measurements from additional wells in the southwest quadrant of the Industrial Area will be made to strengthen groundwater flow and quality interpretations

The following conditions were considered in the development of the sampling strategy

- The operating history of Building 123 suggests that volatile organic, metal, radionuclide, cyanide, and nitrate contaminants may have been released to the environment from surface and subsurface sources,
- The physical and chemical properties of the contaminants suggest a chronic presence if released into the environment,
- Historical data indicate the presence of contaminants in quantities above the maximum background concentrations defined by Site Procedure 3-PRO-140-RSP-09 03, *Radiological Characterization of Bulk or Volume Solid Materials* and the *Background Geochemical Characterization Report* (DOE 1993), and
- Subsurface industrial area structures and operations may cause local effects on groundwater flow direction and discharge that affect monitoring system design

The conceptual model of contaminant migration to groundwater involves percolation of liquids from surface soils and subsurface drains downward through the unsaturated zone to the water table and leaching of contaminants from subsurface waste lines during high water table periods After contaminants encounter the saturated zone, contaminant migration will proceed laterally and follow the principal direction of groundwater flow Groundwater at Building 123 is presumed to flow in an easterly to northeasterly direction Contaminant movement in the unsaturated and saturated zones may be retarded to various degrees by sorption, volatilization, or biodegradation, depending on the chemical behavior of the contaminant Contaminant concentrations may also be reduced by dispersion during migration Paved portions of the Building 123 area, which encircle much of the building to the surrounding streets, are expected to significantly impede contaminant migration from the surface, as most precipitation and surface runoff is diverted to the storm water drainage system instead of percolating through the ground surface (DOE 1992b)

3.0 DATA QUALITY OBJECTIVES (DQOs)

The data quality objective process consists of seven steps and is designed to be iterative, the outputs of one step may influence prior steps and cause them to be refined Each of the seven steps are described below for the investigative area in Figure 4-1 Data requirements to support this project were developed and are implemented in the project using criteria established in *Guidance for the Data Quality Objective Process*, QA/G-4 (EPA 1994)

3 1 State the Problem

Previous investigations of the Site have identified various types of contamination that have either been released to soils or leaked from various subsurface process lines and/or sumps The purpose of this investigation is to determine the presence or absence of potential hazardous and/or radioactive contamination in groundwater found upgradient and downgradient of Building 123 from contaminant releases described in Section 1 2

3 2 Identify the Decision

<u>Groundwater</u>

Decisions required to be made using data collected from groundwater wells and samples include

- Do contaminants of concern from Building 123 impact groundwater above the RFCA Action Levels?
- Does D&D activity create an adverse impact to groundwater quality?
- Do water table elevations and resulting groundwater flow path interpretations reinforce the groundwater quality results?

NOTE Soil contamination will be addressed under the *Soil Sampling and Analysis Plan (SAP) to Characterize Individual Hazardous Substance Sites (IHSSs) 121 and 148 at Building 123, Revision 1, RF/RMRS-97-023*, provided under separate cover Data collected from both investigations will be used by ER to evaluate and rank IHSSs 121 and 148

3 3 Identify Inputs to the Decision

Inputs to the decision include radiochemical and chemical results from groundwater samples collected from newly-installed monitoring wells for comparison to RFCA Action Levels (DOE, 1997) The parameters of interest include the analyses outlined in Table 4-2

Further inputs to the decision include water level measurements from new and existing monitoring wells, which will be used to delineate groundwater flow directions for interpretation of groundwater analytical data Land surveying of new well casing locations (± 1 foot) and elevations (± 0 01 foot) will be conducted to provide control for potentiometric contouring

3 4 Define the Boundaries

The investigative boundaries and rationale are detailed in Section 4 of this SAP

3 5 Decision Rule

If the radiochemical activities or chemical concentrations in the groundwater exceed the RFCA groundwater action levels, an evaluation of potential impacts to surface water is required

3 6 Decision Limits

Decision on further investigation will be based on the results of the ER Ranking Additional characterization, if required, will be based upon an evaluation of data collected under this SAP Well locations are based on previous hydrogeologic investigations, current-day field observations, reinterpretation of groundwater flow directions, and the location of contaminant releases and OPWLs and RCRA process lines Groundwater monitoring will be performed in accordance with this SAP and the RFETS Integrated Monitoring Plan (DOE 1997)

3 7 Optimize the Design

In the event that further characterization is required to evaluate contaminant releases to groundwater from Building 123, the results of this investigation will be used design additional field activities, such as selection of additional well locations and refinement of the analytical parameter suite Additional phases of field activity will be implemented under a separate SAP or the IMP

4.0 SAMPLING ACTIVITIES AND METHODOLOGY

4 1 Monitoring Well Locations and Numbering

Six (6) monitoring well locations have been chosen to monitor groundwater quality associated with Building 123 Two (2) wells will be positioned along the west side of the building to monitor upgradient groundwater quality, and four (4) wells will be positioned along the east side to monitor downgradient groundwater quality Figure 4-1 illustrates the location of these wells with relationship to Building 123 and surrounding features The total number and arrangement of wells reflects the spatial complexity of contaminant releases at the building and uncertainty regarding the configuration of the local groundwater flow field Individual well locations were determined with respect to potential contaminant source areas, proposed soil sampling locations (RMRS, 1997d), and an assumed east to northeast groundwater flow direction Well names (location codes) were assigned based on a five digit numbering system adopted by ER in 1992, with the year drilled indicated by the last two digits The rationale for each monitoring well location is summarized in Table 4-1

Table 4-1 Monitoring Well Location Rationale

Well Number	Location	Rationale
10098	Between Bldgs 123 and 122 at NW corner	Monitor upgradient groundwater quality
10198	Between Bldgs 123 and 122 at SW corner	Monitor upgradient groundwater quality
10298	NE corner of Bldg 123 north of Bldg 114	Monitor groundwater quality downgradient from IHSS 148 and Room 109C
10398	NE corner of Bldg 123 south of Bldg	Monitor groundwater quality downgradient

	114	from IHSS 148 and 121
10498	Between Bldgs 123 and 441 at SE corner	Monitor groundwater quality downgradient from IHSSs 121 and 148, and PACs
10598	Between Bldgs 123 and 460 at SE corner	Monitor groundwater quality downgradient from IHSS 121 and PACs

4 2 Well Design and Installation

4 2 1 Well Design

The type of monitoring wells selected for installation at Building 123 are small diameter well points that are suitable for monitoring shallow (<20 foot depth) water-bearing zones These well points will have screens set in the uppermost 10-foot section of the saturated zone to detect for lateral migration of contaminants, based on the apparent limited use of dense non-aqueous phase liquids (DNAPLs) at the facility and depth limitations of the Geoprobe A screened interval of 6 to 16 feet is selected for all wells to account for seasonal fluctuations in water table depth, which is assumed to exist at a base level of about 6 to 7 feet below ground surface Final depth determinations will be made in the field based on actual drilling and initial depth to water results

All wells will be installed using conventional single casing construction methods described in GT 06, *Monitoring Well and Piezometer Installation* Typical well construction materials will consist of 0 75 inch inner diameter (ID), schedule 40 or 80 polyvinyl chloride (PVC) riser and factory cut (0 010-inch slot width) well screen Protective casing consisting of 2-inch ID steel riser with locking cap and lock will be set in sackrete to a depth of about 1 foot Flush-mount protective casings may be required to avoid damage in the heavily trafficked areas around Building 123 and will be installed on a case-by-case basis

Although the small diameter of these wells precludes the installation of dedicated monitoring devices for low-flow rate sampling purposes, the wells should provide for the collection of groundwater samples that are comparable in quality to larger-diameter RFETS monitoring wells sampled with a bailer Low-flow rate sampling using non-dedicated equipment may be possible for certain analytes provided that well yields are sustainably high It is expected that these monitoring wells will be

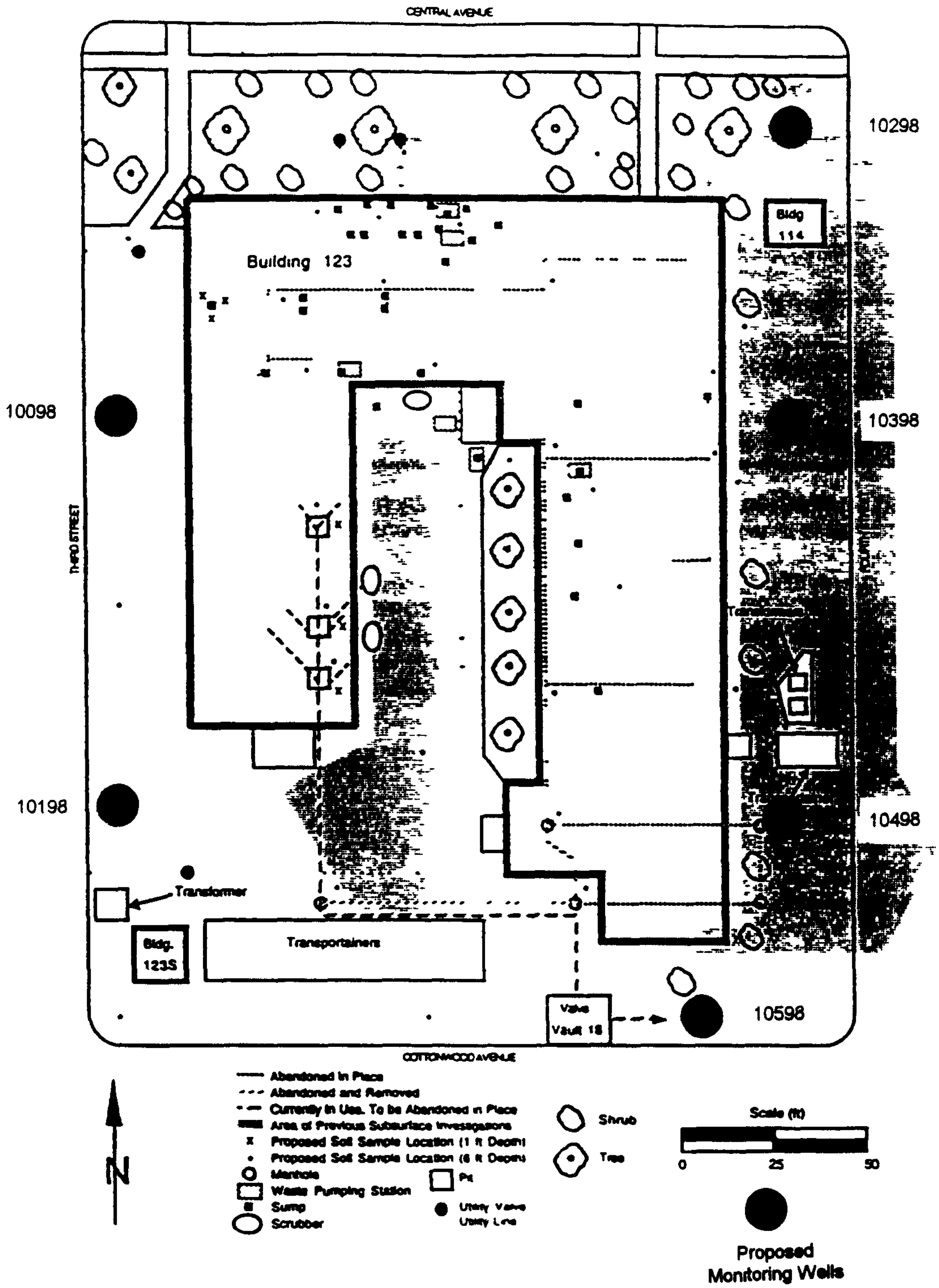


Figure 4-1 Monitoring Well Locations

limited to a servicable life of a few years for D&D monitoring purposes only

4 2 2 Pre-Drilling Activities

Before advancing boreholes, all locations will be cleared in accordance with GT 10, *Borehole Clearing*, and marked in accordance with GT 39, *Push Subsurface Soil Sampling* A prework radiological survey will be conducted in accordance with FO 16, *Field Radiological Measurements* All necessary Health and Safety protocols will be followed in accordance with the *Building 123 Decommissioning Project Health and Safety Plan* (RF/RMRS-97-022) and addendums, as appropriate

4 2 3 Borehole Drilling and Logging

Boreholes will be drilled using push-type techniques (Geoprobe) at all proposed well locations Detailed drilling and sampling procedures using this methodology are provided in GT 39 If probe refusal is encountered before reaching the target borehole depth, the borehole will be abandoned using procedure GT 05, *Plugging and Abandonment of Boreholes*, and an offset boring will be attempted within 3 feet of the original boring Where pavement exists at a wellsite, a pre-cut opening will be removed before drilling starts

Soil cores will be recovered continuously in two-foot increments using a 1-inch diameter by 24-inch long stainless steel- or lexon-lined California core barrel Following recovery, cores will be monitored with a Flame Ionization Detector (FID) or a Photoionization Detector (PID) in accordance with Site Procedure 5-1000-OPS-FO 15, *Photoionization Detectors and Flame Ionization Detectors,* for health and safety purposes The core samples will then be boxed and logged in accordance with GT 01, *Logging Alluvial and Bedrock Material,* except that logging will be conducted more qualitatively than specified in GT 01 (i e , sieving, microscope examination, and plasticity testing will not be conducted) All core boxes will be labeled and transferred to an ER core storage conex for archiving following project completion

4 2 4 Well Installation

Groundwater monitoring wells will be installed in accordance with GT 06, *Monitoring Wells and Piezometer Installation* Monitoring wells will be land surveyed in accordance with GT 17, *Land Surveying*, or RFETS global positioning system manuals (Ashtech, 1993)

4 3 Well Development

Monitoring wells will be developed prior to sampling using the procedures specified in GW 02, *Well Development,* with the exception that repeated vigorous surgings followed by overpumping using a bailer may be employed to expedite borehole formation damage restoration and maximize well yields for groundwater sampling This approach has the best chance for success in wells containing a sufficient water column for surging and a thin annular sand pack, such as Geoprobe well points Under these conditions, fines removal associated with formation damage can be more effectively accomplished because a much greater amount of surging energy is transmitted through the sand pack to dislodge materials at the borehole wall interface compared to wells completed with thick annular sand packs All water produced during well development will be handled as uncharacterized development water in accordance with FO 05, *Handling Purge and Development Water*

4 4 Sample Designation

The site standard sample numbering system will be implemented in this project Location codes have been assigned to individual wells as shown in Figure 4-1 and listed in Table 4-1 using the ER well numbering convention adopted in 1992 For each groundwater sample collected from a well, dual sample numbers will be assigned 1) a standard RIN sample number (i e , 98A000X 00X 00X) will be assigned to the project by the Analytical Services Division (ASD), and 2) an RMRS sample number (i e GW0XXXXTE) for internal sample tracking The block of sample numbers will be of sufficient size to include the entire number of possible samples (including QA samples) and location codes For the final report, the ASD and RMRS sample numbers will be cross-referenced with location codes

4 5 Sample Collection

Prior to sample collection, the water level will be measured according to GW 01, *Water Level Measurements in Wells and Piezometers*, to determine purge water requirements During the initial sampling round, water level measurements will also be taken from the following existing wells to aid in potentiometric map construction for the interpretation of groundwater quality data

P415889	P416489	P115089	P114689	P218289	46492
P415989	P416589	P114989	P115689	68194	
P416089	P416689	P114889	P414189	68294	
P416189	P416789	P115489	P313489	68394	
P416289	P416889	P115589	P320089	68494	
P416389	P419689	P114789	P314289	4486	

Groundwater samples will be collected using the methods specified in GW 05, *Field Measurement of Groundwater Field Parameters*, and GW 06, *Groundwater Sampling,* as modified for small diameter well points Sampling procedures will be further modified for wells that prove to be incapable of yielding a full sample suite over the 3-day sampling period currently specified in GW 06, *Groundwater Sampling* These wells will be revisited and sample collection will continue past the third day as long as the well recharges sufficiently to warrant repeated sampling visits Low flow rate sampling methods will be implemented for metals and uranium isotopes if all wells prove to be capable of providing a sustainable yield of 100 ml/minute or greater with minimal drawdown, otherwise, sampling will be performed with a small diameter bailer After an initial sampling round is completed for all new wells, sampling of selected wells will be conducted on a semi-annual basis in support of D&D monitoring, as specified by the IMP (to be modified for Building 123 monitoring wells)

If necessary, a Health and Safety Specialist (HSS) or Radiological Control Technician (RCT) will scan each sample with a Field Instrument for the Detection of Low Energy Radiation (FIDLER) Equipment will also be monitored for radiological contamination during and after sampling activities All sampling equipment will be decontaminated with an liquinox solution, and rinsed with deionized or distilled water, in accordance with Environmental Management Department (EMD) Operating Procedure 5-21000-OPS-FO 03, *General Equipment Decontamination, Section 5 3 1, Cleaning Steel or Metal Sampling Equipment Without Steam in the Field* All other sampling equipment will include standard items such as chain of custody seals and forms, logbooks, etc

Health and safety requirements will be specified in an addendum to the *Building 123 Decommissioning Project Health and Safety Plan* (RF/RMRS-97-022) Personal protective equipment (PPE), air monitoring requirements, and hazard assessments not otherwise defined in the Building 123 PAM will be addressed in the addendum

4 6 Sample Handling and Analysis

Samples will be handled according to *Environmental Management Department (EMD) Operating Procedures Volume/ Field Operations*, RMRS/OPS-PRO 069, *Containing, Preserving, Handling, and Shipping of Soil and Water Samples*, and OPS-FO 10, *Receiving, Labeling, and Handling of Environmental Containers*

Table 4-2 indicates the analytical requirements for each sample Samples will be submitted to an offsite, EPA-approved laboratory for analysis under a 30-day result turnaround time

Table 4-2 Analytical Requirements for Groundwater Samples

Analysis	Matrix	No of Samples/ Event	EPA Method	Container	Preservation	Holding Time
Target Analyte List (TAL) Metals	Water	6	EPA CLP plus additional metals	1 (one) 1-liter poly bottle	Field filtered (0 45 µm membrane), Cool, 4° C, HNO_3 to pH<2	180 Days
Target Compound List (TCL) Volatiles	Water	6	EPA 524 2	3 (three) 40 ml amber glass vials with teflon-lids	Unfiltered, cool, 4° C, HCL to pH<2	14 days
Nitrates	Water	6	EPA 300 Methods	1 (one) 250 ml poly bottle	Cool, 4° C, H_2SO_4 pH<2	28 days
Cyanide	Water	6	EPA 9010	1 (one) 1-liter poly bottle	Unfiltered, NaOH to pH>12, Cool, 4° C	14 days

Analysis	Matrix	No of Samples/ Event	EPA Method	Container	Preservation	Holding Time
Uranium Isotopes (U233/ 244, U235, and U-238)	Water	6	N/A[a]	1 (one) 1-liter poly bottle	Field filtered (0 45 μm membrane), HNO_3 to pH < 2	180 days
Am-241, Pu-239/240	Water	6	N/A[a]	1 (one) 4-liter poly bottle	Unfiltered, HNO_3 to pH < 2	180 days
Cs-137	Water	6	N/A[a]	1 (one) 4-liter poly bottle	Unfiltered, HNO_3 to pH < 2	180 days
Rad Screen	Water	6	N/A[a]	1 (one) 125 ml poly bottle	Unfiltered	180 days

[a] No EPA-approved method is currently in place for radionuclide analyses However, guidance is provided in procedures defined in Environmental Monitoring Support Laboratory (EMSL)-LV 0539-17, *Radiological and Chemical Analytical Procedures for Analysis of Environmental Samples*, March 1979

4 7 Equipment Decontamination and Waste Handling

Reusable sampling equipment will be decontaminated in accordance with procedure FO 03, *Field Decontamination Procedures* Decontamination waters generated during the project will be managed according to procedure FO 07, *Handling of Decontamination Water and Wash Water* Geoprobe equipment will be decontaminated following project completion using procedure FO 04, *Decontamination of Equipment at Decontamination Facilities* Personal protective equipment will be disposed of according to FO 06, *Handling of Personal Protective Equipment*

5.0 DATA MANAGEMENT

A project field logbook will be created and maintained by the project manager or designee in accordance with Site Procedure 2-S47-ER-ADM-05 15, *Use of Field Logbooks and Forms* The logbook will include time and date of all field activities, sketch maps of sample locations, or any additional information not specifically required by the SAP The originator will legibly sign and date each completed original hard copy of data Appropriate field data forms will also be utilized when required by the operating procedures that govern the field activity A peer reviewer will examine each completed original hard copy of data Any modifications will be indicated in ink, and initialed and dated by the reviewer Logbooks will be controlled through RMRS Document Control

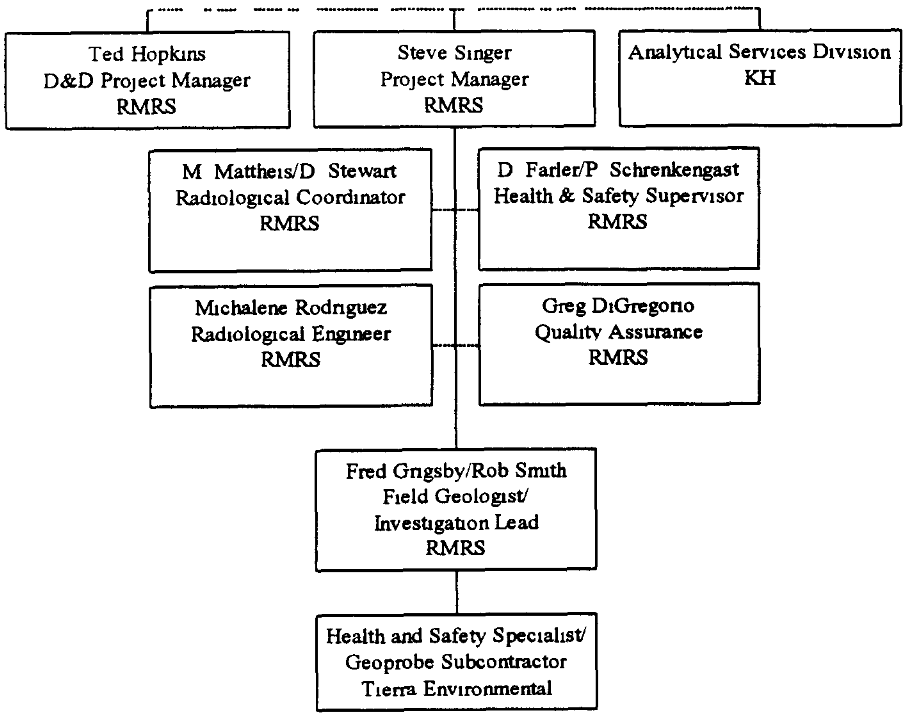
Analytical data record storage for this project will be performed by KH-ASD Sample analytical results will be delivered directly from the laboratory to KH-ASD in an Electronic Disc Deliverable (EDD) format and archived in the Soil and Water Database (SWD) Hard copy records of laboratory results will be obtained from KH-ASD in the event that the analytical data is unavailable in EDD or SWD at the time of report preparation Analytical results will be compiled into a sampling and analysis report in coordination with the Soil Sampling SAP results

6.0 PROJECT ORGANIZATION

Figure 6-1 illustrates the project organization structure The RMRS ER Groundwater Operations project manager will be the primary point of responsibility for maintaining data collection and management methods that are consistent with Site operations Other organizations assisting with the implementation of this project are RMRS Health and Safety, RMRS Quality Assurance, RMRS Radiological Engineering, and KH-ASD

Sampling personnel will be responsible for field data collection, documentation, and transfer of samples for analysis Field data collections will include sampling and obtaining screening results Documentation will require field logs and completing appropriate forms for data management and chain-of-custody shipment The sampling crew will coordinate sample shipment for on-site and off-site analyses through the ASD personnel The sampling manager is responsible for verifying that chain-of-custody documents are complete and accurate before the samples are shipped to the analytical laboratories

Figure 6 1
Building 123 Hydrogeologic Characterization Organization Chart



7.0 QUALITY ASSURANCE

All components and processes within this project will comply with the RMRS Qualify Assurance Program Description RMRS-QAPD-001, 1/1/97, which is consistent with the K-H Team QA Program The RMRS QA Program is consistent with quality requirements and guidelines mandated by the EPA, CDPHE and DOE In general, the applicable categories of quality control are as follows

- Quality Program,
- Training,
- Quality Improvement,
- Documents/Records,
- Work Processes,
- Design,

- Procurement,
- Inspection/Acceptance Testing,
- Management Assessments, and
- Independent Assessments

The project manager will be in direct contact with QA to identify and correct issues with potential quality affecting issues Field sampling quality control will be conducted to ensure that data generated from all samples collected in the field for laboratory analysis represent the actual conditions in the field The confidence levels of the data will be maintained by the collection of QC and duplicate samples, equipment rinsate samples, and trip blanks

Duplicate samples will be collected on a frequency of one duplicate sample for every twenty real samples Rinsate samples will be generated at a frequency of one rinsate sample for every 20 real samples collected Trip blanks will accompany each shipment of VOC samples generated for the project Trip blanks will not be required for samples shipped for radiochemical analysis only Data validation will be performed on 25% of the laboratory data according to the Rocky Flats ASD, Performance Assurance Group procedures Samples will be randomly selected from adequate surface and subsurface sample sets (RINS) by ASD personnel to fulfill data validation of 25% of the total number of VOC and radioisotopic analyses Table 5-1 provides the QA/QC samples and frequency requirements of QA sample generation

Table 5-1 QA/QC Sample Type, Frequency, and Quantity

Sample Type	Frequency	Comments	Quantity (estimated)
Duplicate	One duplicate for each twenty real samples		1
Rinse Blank	One rinse blank for each twenty real samples	To be performed with reusable sampling equipment following decontamination procedures	1
Trip Blank	One trip blank per shipping container	VOC analysis shipments only	1

Analytical data that is collected in support of the Building 123 Soil SAP will be evaluated using the guidance developed by the Rocky Flats Administrative Procedure 2-G32-ER-ADM-08 02, *Evaluation of ERM Data for Usability in Final Reports* This procedure establishes the guidelines for evaluating analytical data with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters

A definition of PARCC parameters and the specific applications to the investigation are as follows

<u>Precision</u> A quantitative measure of data quality that refers to the reproducibility or degree of agreement among replicate or duplicate measurements of a parameter The closer the numerical values of the measurements are to each other, the lower the relative percent difference and the greater the precision The relative percent difference (RPD) for results of duplicate and replicate samples will be tabulated according to matrix and analytical suites to compare for compliance with established precision DQOs Specifications on repeatability are provided in Table 5-2 Deficiencies will be noted and qualified, if required

<u>Accuracy</u> A quantitative measure of data quality that refers to the degree of difference between measured or calculated values and the true value of a parameter The closer the measurement to the true value, the more accurate the measurement The actual analytical method and detection limits will be compared with the required analytical method and detection limits for VOCs and radionuclides to assess the DQO compliance for accuracy

<u>Representativeness</u>. A qualitative characteristic of data quality defined by the degree to which the data absolutely and exactly represent the characteristics of a population Representativeness is accomplished by obtaining an adequate number of samples from appropriate spatial locations within the medium of interest The actual sample types and quantities will be compared with those stated in the SAP or other related documents and organized by media type and analytical suite Deviation from the required and actual parameters will be justified

<u>Completeness</u>. A quantitative measure of data quality expressed as the percentage of valid or acceptable data obtained from a measurement system A completeness goal of 90% has been set for this SAP Real samples and QC samples will be reviewed for the data usability and achievement of internal DQO usability goals If sample data cannot be used, the non-compliance will be justified, as required

<u>Comparability</u>. A qualitative measure defined by the confidence with which one data set can be compared to another Comparability will be attained through consistent use of industry

standards (e g , SW-846) and standard operating procedures, both in the field and in laboratories Statistical tests may be used for quantitative comparison between sample sets (populations) Deficiencies will be qualified, as required Quantitative values for PARCC parameters for the project are provide in Table 5-2

Laboratory validation shall be performed on 25% of the characterization data collected in support of this project Laboratory verification shall be performed on the remaining 75% of the data Data usability shall be performed on laboratory validated data according to procedure 2-G32-ER-ADM-08 02, *Evaluation of ERM Data for Usability in Final Reports*

Table 5-2 PARCC Parameter Summary

PARCC	Radionuclides	Non-Radionuclides
Precision	Duplicate Error Ratio ≤ 1 42	RPD ≤ 30% for Organics RPD ≤ 40% for Non-Organics
Accuracy	Detection Limits per method and ASD Laboratory SOW	Comparison of Laboratory Control Sample Results with Real Sample Results
Representativeness	Based on SOPs and SAP	Based on SOPs and SAP
Comparability	Based on SOPs and SAP	Based on SOPs and SAP
Completeness	90% Useable	90% Useable

Data validation will be performed according to KH-ASD procedures, but will be done after the data is used for its intended purpose Analytical laboratories supporting this task have all passed regular laboratory audits by KH-ASD

8.0 SCHEDULE

Well installation activities are scheduled to begin in mid to late June 1998 in coordination with soil sampling activities (see RF/RMRS-97-023) Well development and groundwater sampling will commence within one week of well completions Measurement of water levels for potentiometric map construction will be conducted within one week of groundwater sampling It is anticipated that all characterization data will be summarized for ER Ranking by August 17, 1998

9.0 REFERENCES

Ashtech, 1993, *Ashtech XII GPS Receiver Operating Manual, Version 7*

DOE 1992a, *Final Phase I RFI/RI Work Plan for Operable Unit 9, Original Process Waste Lines*

DOE 1992b, *Final Phase I RFI/RI Work Plan for Operable Unit 13, 100 Area, October*

DOE 1992c, *Historical Release Report for the Rocky Flats Plant, Rocky Flats Plant, Golden, CO*

DOE 1993, *Background Geochemical Characterization Report, September*

DOE 1994, *Final Phase I RFI/RI Work Plan for Operable Unit 9, Technical Memorandum No 1, Volume IIA-Pipelines, November*

DOE 1995, *Data Summary No 2 for Operable Unit No 13, 100 Area, RF/ER-95-0090, Draft, June*

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DOE 1997, *RFETS, Integrated Monitoring Plan, June*

EG&G, 1994, *Technical Memorandum No 1, Investigation of Foundation Drains, Operable Unit 8, RFP/ERM-94-00011, Rev 0*

EG&G, 1995a, *Geologic Characterization Report for the Rocky Flats Environmental Technology Site, Volume 1 of the Sitewide Geoscience Characterization Study, Final Report, April*

EG&G, 1995b, *Hydrogeologic Characterization Report for the Rocky Flats Environmental Technology Site, Volume II of the Sitewide Geoscience Characterization Study, Final Report, April*

EG&G, 1995c, *1994 Well Abandonment and Replacement Program Final Report, Rocky Flats Environmental Technology Site, March*

EPA 1994, *Guidance for Data Quality Objectives Process, EPA QA/G-4, September*

RMRS 1997a, *Proposed Action Memorandum for the Decommissioning of Building 123, May*

RMRS 1997b, *RMRS Quality Assurance Program Description, RMRS-QAPD-001, Rev 1, January*

RMRS 1997c, *Final Sampling and Analysis Plan for the Pre-Remedial Investigation of the Mound Site Plume, February*

RMRS 1997d, *Soil Sampling and Analysis Plan to Characterize Individual Hazardous Substance Sites (IHSSs) 121 and 148 at Building 123, RF/RMRS-97-023, Revision 1, May 14, 1998*

RMRS, 1997e, *1996 Annual Rocky Flats Cleanup Agreement (RFCA) Groundwater Monitoring Report for Rocky Flats Environmental Technology Site, RF/RMRS-97-087 UN, November*

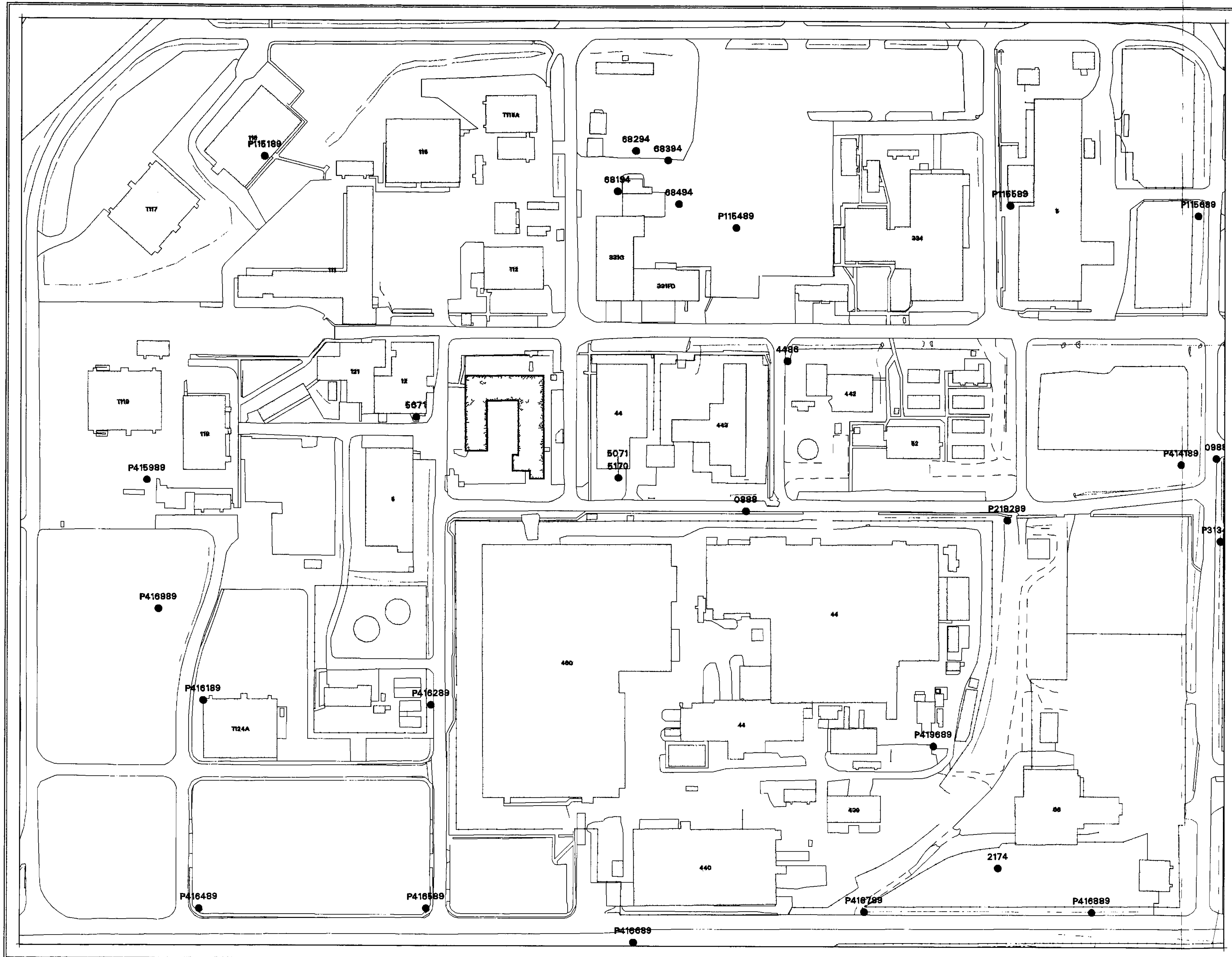

Figure 1 3

Building 123 Monitoring Well Locations

● Groundwater Monitoring Well

● Abandoned Groundwater Well

Standard Map Features

Buildings and other structures

Lakes and ponds

Streams ditches or other drainage features

Fences and other barriers

Paved roads

Dirt roads

DATA SOURCE uildings, ences, ydrography, roads an ot er structures from 89 aerial fly-over dat captured by &G RSL, Las Vegas. Digitized from he orthophotographs. 1/95

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U S Department of Energy
Rocky Flats Environmental Technology Site

Prepared by

RMRS Rocky Mountain Remediation Services L.L.C.
Geographic Information ystems Group

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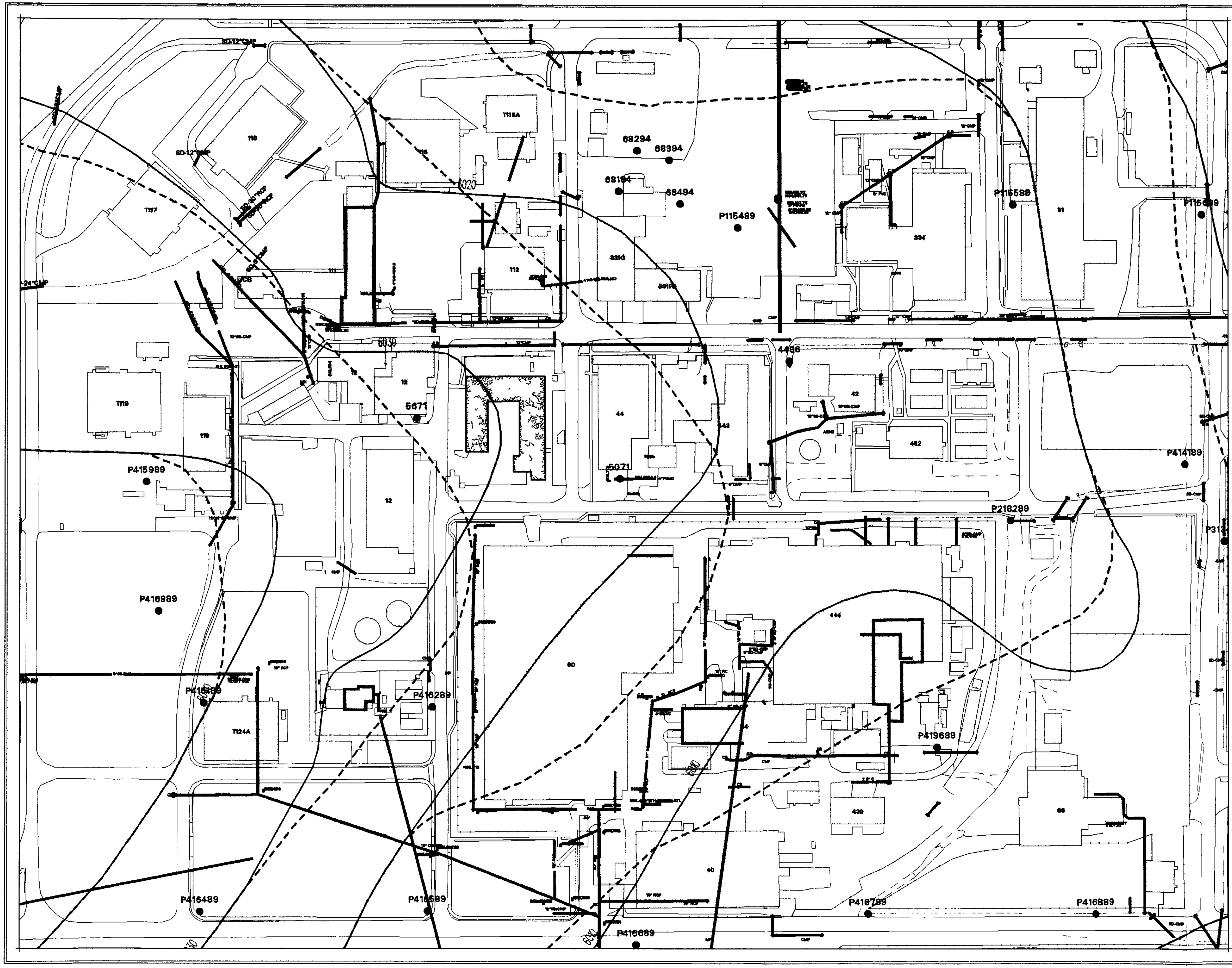

Figure 1-4

Building 123 Hydrogeological Characteration

Potentiometric Surface of Unconsolidated Surficial Deposits
(Second Quarter 1996 Data)

- Groundwater Monitoring Well
- Revised Water Level Contours (this report)
- Original Water Level Contours (RMRS 1997e Plate 2)
- Foundation Drains
- Storm Drains

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams ditches or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads

DATA SOURCE
Foundation Drai dat digitized from Hydrogeologic Characterization Repo Plate 23: Building Footprint, Foundation Drain and Groundwater Diversion/Extraction System Map, April 1995 (Stoller Corp.)
Storm Drainage System converted from EG&G Facilit Engineer CAD drawn file (DXF) 1993. The location drainage system lines should only be use for general location information The i formation has OT undergon QA/Q for accuracy or completeness.
dings, fences, ydrography, roads an other structures from aerial fly-over dat captured G&G RSL, Las egas.
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U S Department of Energy
Rocky Flats Environmental Technology Site

Prepared by

RMRS Rocky Mo ntal Remediatio Services L.L.C
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